

CLAIMS:

1. A directly modulated, distributed feedback laser having an output beam responsive to the application of an input biasing current, wherein the output response is
5 overdamped without reducing the relaxation oscillation frequency of the laser output, so as to quickly respond to a change in the input biasing current.

2. A laser according to claim 1 in which the overdamped response is obtained by strongly gain-coupling
10 the laser.

3. A laser according to claim 2 in which the gain coupling is sufficient to provide, in the environment in which the laser is to operate, a significant reduction in the received power penalty from a laser having less gain
15 coupling.

4. A laser according to claim 2, in which the level of gain coupling exceeds a threshold level, whereby, in the environment in which the laser is to operate, there is a significant reduction in received power penalty from a laser
20 with gain-coupling less than the threshold level, but no significant further reduction in received power penalty will be obtained from a laser with gain-coupling greater than the threshold level.

5. A laser according to claim 2 in which, in the
25 environment in which the laser is to operate, the level of gain coupling is sufficient to provide a 3dB reduction in the received power penalty from a laser having no gain coupling.

6. A laser according to claim 1 in which the input biasing current is modulated at a frequency which approaches the relaxation oscillation frequency of the laser output.

7. A laser according to claim 2 in which the
5 environment is uncooled.

8. A method of creating a laser comprising the steps
of:

(a) growing a semiconductor substrate;

(b) depositing a first doped semiconductor layer

10 upon the substrate;

(c) creating an active semiconductor region over
the first doped layer;

(d) depositing a second doped semiconductor layer
having a charge opposite to that of the first doped layer
15 upon the active region;

(e) defining an index grating which extends along
the length of the semiconductor layers;

(f) selectively etching away the second doped
layer and at least a portion of the active region in
20 accordance with the layout of the index grating to a depth
sufficient to produce a gain coupling sufficient to overdamp
the output response of the resulting device;

(g) infilling the etched regions with doped
material consistent with the composition of the second doped
25 layer;

(h) removing the substrate;

(i) etching the semiconductor layers to a suitable width and cleaving the semiconductor layers to a suitable length; and

(j) adjusting the reflectivity of the front and
5 rear facets so as to permit lasing to occur when a biasing
signal is applied across the junctions created by the
semiconductor layers,

whereby the output response of the laser is
adapted to quickly respond to a change in the current level
10 of the applied biasing signal.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100